Food, Fuel, and Feed Prices–the Perfect Storm?

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A complex set of forces is determining the prices for food and energy, and today I am going to spend most of the time on the trends–the context–underlying the current price situation. There are no simple explanations or easy remedies for high energy or feed costs. They are not the consequence of a single factor, like oil companies gouging consumers. Rather, high prices are the result of the confluence of numerous factors, some a long time in the making. I first deal with causes of the current price situation and then I will discuss the commodity and feed outlook. Finally, I will comment briefly on the relationship of ethanol production to food prices.

What has led to the current price situation?

Both energy and other commodity prices are explainable in terms of the current supply and demand situation *and expected economic conditions.* Since World War II and especially since 1960, the supply of food tended to grow relative to demand, and this combined with rising incomes resulted in food expenditures declining as a proportion of incomes, especially for American consumers. Likewise, with the exception of 1978-79, the supply of oil was typically ample relative to demand.

Our habits and infrastructure adjusted to these relatively low prices. Few incentives existed to conserve energy. U.S. drivers fell in love with large SUVs. Likewise, food consumption in the U.S. shifted toward products with many built-in services, and away-from-home eating increased. As food expenditures declined relative to personal incomes, money was released to buy other things. Given these consumption habits, higher prices for food and fuel are painful.

Growth in the supply of agricultural commodities was (and is) largely a function of increased productivity in farming, which in turn depends on research. The world experienced the "green revolution." Yields outpaced demand, helping keep food prices low. But, the seemingly ample supply of grains tended to reduce the incentive to invest in productivity-increasing research. Recently, the growth in yields seems to be slowing.

On the demand side, the world's population continues to grow. In addition, the two countries with the largest populations–India and China–have experienced exceptional economic growth in recent years. Larger incomes mean larger demands for energy and food. Moreover, larger incomes result in a shift in demand from cereals to animal products, and animal products require grain. U.S. corn exports were 1.8 billion bushels in 2004-05, and are estimated to be 2.5 billion bushels this year (2007-08).

Also, as you know, another source of demand for grains and oil seeds is that for conversion to bio-fuels. About 1.3 billion bushels of corn were converted to fuel-ethanol in 2004-05, and three years later, in the current marketing year, 3.0 billion bushels of corn are being processed into ethanol. For 2008-09, the USDA predicts that about 4.0 billion bushels of corn will be used for ethanol–nearly 25% of total use. This demand is being fueled by high prices for oil as well as by incentives provided by the U.S. for the production of bio-fuels.

Thus, crop production has not kept pace with the sharp increase in the world's demand for food. This is reflected in declining stocks-to-use ratios. For the world, the ending inventory of wheat was 25% of total use in 2004-05, and three years later ending stocks will be about 20% of use. The same is true in the U.S., with a carryover of just 239 million bushels of wheat or about 10% of total use in the marketing year just ended (on May 31).

The outlook for the future supply of grains and petroleum is uncertain, and changing expectations will influence current prices. With small stocks-to-use ratios, prices are especially sensitive to changes in expectations about forthcoming crop sizes. How big will the U.S. corn crop be this year? the wheat crop in the U.S., Canada, Australia, and elsewhere? the rice crop in Southeast Asia and elsewhere?

A similar comment can be made about the price of oil. There is growing pessimism that the world-wide supply of oil can continue to grow as fast as the demand for oil. New sources of petroleum are likely to cost much more to produce. Moreover, much of the world's oil is produced in "politically sensitive" regions. With a tight supply-demand balance, prices respond to news about the conflict in Nigeria, Iranian-U.S. relations, etc. (High energy prices, in turn, influence the costs of producing farm products, their processing, transportation, etc.) It is difficult to forecast the price of oil and to tell whether or not current prices are partly the consequence of a speculative bubble. Much of current price levels appears to be related to the growing world-wide demand for oil relative to the ability of supply to meet these demands.

As an aside, it is my understanding that approximately 75% of the retail price of gasoline is a function of the price of oil. The other 25% is the refining margin, the transport cost to move gasoline from refinery to retail outlets, the retail margin, and taxes. Recent refining margins have been negative, because refiners have not been able to raise prices as fast as the price of oil. Integrated firms, like Exxon, are making large profits because the price of oil is much higher than the average cost of extracting the oil from the fields that they own. (Similarly, countries like Saudi Arabia are the beneficiaries of high oil prices.) The world-wide price of oil, however, is not set by the oil companies, but by world-wide supply and demand.

Prices for fuel and food in the U. S. are also influenced by the depreciation of the dollar relative to other major currencies. At one time, the dollar and the Euro were on a par, but now it takes about $1.55 to buy one Euro. The consequences from the U.S. perspective are that the prices of imports, such as petroleum, rise and that the prices of exports, such as corn, decrease. Exports are encouraged; imports discouraged. The depreciation of the dollar is related to the U.S. "living beyond its means." In the long run, it would help if the federal government could reduce its deficit spending and hence the borrowing of large sums of money.

Other "remedies" will also take time. If the food supply is going to keep up with demand, in an environmentally friendly way, then it is essential that society increase its investments in research that will improve agricultural productivity. Given the time lags involved in the research, development and use of new technologies, it is none too soon to start. In the

U.S., some acres can be moved from the conservation reserve over time, but these typically are not prime farm land, and there will be concerns about the environmental consequences of returning this land to row crops. Some more land can be moved into crop production in Brazil and perhaps a few other countries, but again concerns about environmental effects exist. Dietary adjustments to high prices can help a little.

Solutions to the energy supply-demand balance also depend importantly on new technology. In the short run, conservation is important to reduce demand. High gasoline prices, though painful, will encourage conservation, and ultimately new energy sources.

Price outlook for commodities and feed

Prices of corn and soybeans, and hence of livestock feeds, over the next year will be highly dependent on the yields of the crops to be harvested this Fall. Planting conditions in the Corn Belt were cold and wet, and hence much of the corn acreage was planted late. Current quotes for new crop futures reflect this fact, and are well above those of six months ago. The price of corn futures for delivery this December 2008, at over $6 per bushel, is above the price for July 2008 delivery (table). The futures market also expects corn prices to remain high through the new harvest of 2009 and 2010. Likewise, new crop soybean futures are well over $13 per bushel for delivery this coming November as well as in 2009 and 2010. Clearly, market participants are concerned about the supply-demand balance.

The USDA estimates for corn and soybean farm prices are below the futures quotes (table). This is partly explainable by the difference in definitions of the two prices. The futures prices are for delivery at specific, approved locations in Illinois. The USDA predictions are for the season-average, nation-wide, farm-level prices, based on estimates from a quantitative model. If total use is subtracted from total supply, the result is the expected ending inventory. For corn, this inventory is expected to be about 11% of use in the year about to end, which is a bit low relative to historical experience. Moreover, an ending inventory of only 5 or 6% of use is predicted by August 31, 2009, which explains the forecast of higher prices in 2008-09 than this year. Likewise, soybean inventories are expected to be small with comparably higher prices. Still, the USDA forecasts look low relative to the prices implied by the futures quotes.

With small inventories, prices will be heavily influenced by growing conditions. Prices will likely decline modestly given ideal growing conditions, but will rise still further with poor growing conditions. One can safely predict that prices will be volatile.

Schmit, Verteramo, and Tomek have developed a model to predict feed prices conditional on the expected level of corn and soybean meal prices. In addition, the model allows for the potential effect of distillers dried grains with solubles (DDGS), a by-product of ethanol, as an input to dairy feeds. With increased ethanol production, the price of DDGS may decline, or at least become a relatively lower-cost input for dairy feed. This model suggests that at current corn and soybean meal prices, dairy feed prices could be 17% larger than those experienced in 2007, but with lower DDGS prices, feed price increases over 2007 might be as little as 6 or 7%. As an aside, the model also suggests that over the 1986 - 2007 sample period, dairy feed prices rose an average of $2 per ton per year independent of input prices.

In concluding this section, I note that the volatility of prices makes forward contracting or hedging decisions difficult. The price of December 2008 corn futures rose over $2 per bushel from November 9, 2007 to May 23, 2008 (table). Corn producers who forward contracted at the earlier prices are disappointed, and if they hedged using the futures markets, they have experienced significant margin calls. On the other hand, a dairy farmer or merchant who bought futures at the earlier, lower prices should be happy. Since prices reflect traders' judgments, prices change with new information, and it is not possible to know what is going to happen to the variables influencing prices. Futures prices reflect only what we currently know.

Ethanol and food prices, a comment

Converting food (corn) to fuel (ethanol) has been subjected to much criticism, but it is not easy to estimate the net impact of ethanol production on food prices. A paper by Perrin is a recent attempt to provide estimates and background references. Much of his analysis is about the U.S. Food prices in the U.S. (the food sub-index of the CPI) rose from 7 to 10% from 2006 to early 2008, the precise amount depending on the length of the comparison period. The lower figure uses September 2006 as the point of comparison, when grain prices started to accelerate.

Perrin takes as a point of departure the fact that the farm value of all grains (including soybeans) constituted just 3.2% of the value of total, retail food sales (including food purchased away from home) in the U.S. Thus, if grains doubled in price, a simple pass-through of these costs would have resulted in the food component of the CPI increasing from 3.2 to about 7%, or a three percentage point increase.

The next question is, however, how much of the increase in the price of grains can be attributed to the demand for corn for ethanol? Perrin reviews a number of estimates, and one of the larger is 40%. He writes, "U.S. ethanol production is responsible for only about 40% of the cumulative increase in world course grain consumption (p. 4)." Thus, he argues that only 40% of the price increase is attributable to corn-based ethanol. Other, model-based estimates are smaller. This is because in the models, higher prices feed back to increase supply, which ameliorates the initial price effect of the increase in demand.

Hence, one way to view Perrin's analysis is that the demand for corn for ethanol at most contributes to 40% of the food price increase that is attributable to higher grain prices, i.e, 0.4 x 3.2% = 1.2%. In words, given a food price increase of 7% over a recent 18 month period, assuming that about one-half of the increase is attributable to higher grain prices, and assuming 40% of the higher grain prices are the consequence of ethanol demand, then the "ethanol effect" on the food component of the CPI is a little over one percentage point. That is, 14% of the 7% increase is the consequence of ethanol demand.

This analysis can be subjected to critical evaluation and alternate conditioning assumptions. I do not have the time or space to do such analyses, but it is the case that commodity input prices are not passed through the marketing system on a one-for-one basis. This is partly explained by the need to process the raw commodity. For example, wheat must be transformed to flour to make bread. If wheat is $6 per bushel (10 cents per pound) and if the transformation rate to flour is 0.75, then the cost of flour to a baker is 13.3 cents per pound ($6/45). If the price of wheat rose to $7 per bushel or 11.67 cents per pound, then the cost of flour would rise, other things equal, to 15.55 cents per pound ($7/45). An increase in the price of wheat of 1.67 cents implies that the price of flour will rise 2.2 cents per pound. Also, Perrin's analysis assumed that grain prices have doubled, but as of this writing they have more than doubled.

A price-moderating factor, not mentioned by Perrin, is that ethanol production keeps fuel prices lower than they otherwise would have been. This would reduce the energy costs in transforming commodities to retail products and hence should have some small cost-reducing effect on food prices.

A major caveat is that the foregoing discussion relates to food prices in the U.S. High grain prices affect the poor much more than the rich. U.S. food expenditures are approximately 10% of income, while in food insecure countries, the value of food consumed is perhaps 70% of income. Moreover, the proportion of grain in the diet is much larger in low income countries than in the U.S. It is certainly the case that a doubling of grain prices can be devastating for families in low income countries. The "ethanol effect" is much larger in such countries.

Concluding points

First, current prices for commodities are the result of a complex set of variables, including expectations about future economic conditions. There is no single "villain." Second, although prices will vary, the average level of food and fuel prices are likely to remain higher than experienced in the 1990s and early 2000s. Third, no easy fixes exist for the current situation. In the short run, individuals can help by conserving energy. In the long run, break-through's in agricultural productivity and in alternative energy sources are needed. It would also help if the Federal government followed more sensible macro-economic policies, but that is another story.

References

Perrin, R. K. "Ethanol and Food Prices - Preliminary Assessment," Agricultural Economics Department, University of Nebraska, Lincoln. www.digitalcommons.unl.edu/ageconfacpub/49

Schmit, T. M., L. Verteramo, and W. G. Tomek, "Implications of Growing Biofuels Demands on Northeast Livestock Feed Costs," AEM, Cornell University, Ithaca. (Contact tms1@cornell.edu for a copy.)

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Supply, Demand, Price Estimates

Marketing Year	Total Supply	Total use	[for Ethanol]	Farm Price
	-	Million Bushels	-	-$/bu-
Corn				
2006/07	12,514	11,210	2,117	3.04
2007/08	14,393	13,010	3,000	4.25
2008/09	13,523	12,760	4,000	5.50
Soybeans				
2006/07	3,647	3,073	-	6.43
2007/08	3,169	3,024	-	10.00
2008/09	3,258	3,073	-	11.25
Soybean Meal	-	Thou. Tons -		-$/ton-
2006/07	43,497	43,146	-	205.00
2007/08	44,350	44,050	-	315.00
2008/09	44,450	44,150	-	340.00

Source: USDA, WASDE - 458, May 9, 2008

Futures Prices, Selected Dates

Contract Month	Corn 11/9/2007	Corn 5/23/2008	Soybeans 11/9/2007	Soybeans 5/23/2008	Meal 11/9/2007	Meal 5/23/2008
	- $/Bu -				- $/ton -	
July 08	3.8675	5.9975	10.74	13.68	286.70	336.60
Dec 08	4.315	6.2725	9.895[a]	13.535[a]	252.50	327.00
Dec 09	4.315	6.145	9.45[a]	13.485[a]	243.50	329.00
Dec 10	-	6.265	-	13.65[a]	-	328.00

[a] = November contract
Source: CBOT